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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ORTIZ, EDGARDO

ART UNIT PAPER NUMBER

2815

DATE MAILED: 03/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/343,293

Applicant(s)
Cheng Et.al.

Examiner
Edgardo Ortiz

Art Unit
2815



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Dec 26, 2002
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 63-90 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 63-90 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ 6) ☐ Other:

Art Unit: 2815

DETAILED ACTION

This Office Action is in response to an amendment filed December 26, 2002 on which Applicant amended claims 63-66, 71, 74-80, 85 and 88-90.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b).

Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 63-75 and 77-89 are rejected under 35 U.S.C. § 102 (e) as being anticipated by Son (U.S. Patent No. 6,063,681). With regard to Claim 63, Son teaches a substrate (21), a gate electrode (25) formed over the substrate and defining an underlying channel region in the substrate, said gate electrode having a barrier layer (26) formed on a sidewall of the gate electrode to prohibit

Art Unit: 2815

silicidation of the sidewall, a source/drain extension (27) formed in the substrate adjacent the gate electrode and having a first silicide layer (29) formed therein, and a source/drain (30) formed in the substrate adjacent the source/drain extension and having an activated doped region with a second silicide layer (33) disposed therein and wherein the activated doped region and the first silicide are aligned with a spacer (31) disposed along sidewalls of the gate electrode, said source/drain extension (27) having less dopant concentration (LDD) than the activated doped region and the source/drain extension and the first silicide layer (29) are aligned with the gate electrode to have the less dopant concentration of the extension reside between the channel region and the activated doped region. See figure 3H.

The claim also includes the limitation "*said second silicide layer formed after removing a portion of said barrier layer formed over a top surface of the gate electrode*", this is a product by process limitation. A "product by process" claim is directed to the product per se, no matter how actually made, In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Marosi et al, 218 USPQ 289; and particularly In re Thorpe, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether

Art Unit: 2815

claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

With regard to Claim 64, Son teaches an activated doped region (30) that is thicker than the source/drain extension (27).

With regard to Claim 65, Son teaches a second silicide layer (33) that is thicker the first silicide layer (29).

With regard to Claim 66, Son teaches an activated doped region (30) and a source/drain extension (27) that comprise ion implanted material (N-type impurity ions).

With regard to Claims 67 and 68, Son teaches first (29) and second (33) silicide layers that can comprise either the same or different metals (titanium, nickel, cobalt).

With regard to Claims 69-73, Son teaches first (29) and second (33) silicide layers that can comprise CoSi_2 , TiSi_2 or nickel silicide.

Art Unit: 2815

With regard to Claim 74, Son teaches a gate electrode (25) having a third silicide layer (33) formed on the top surface of the gate electrode.

With regard to Claim 75, Son teaches a barrier layer (26) that comprises silicon nitride (column 3, lines 48-51).

With regard to Claim 77, Son teaches a semiconductor substrate (21), a gate electrode (25) formed over the semiconductor substrate and defining an underlying channel region in the substrate, said gate electrode having a barrier layer (26) formed on a sidewall of the gate electrode to prohibit the silicidation of the sidewall, a source/drain extension (27) formed in the substrate adjacent the gate electrode and having a first silicide layer (29) formed therein, and a source/drain region (30) formed in the substrate adjacent the source/drain extension and having an activated doped region with a second silicide layer (33) disposed therein, the activated doped region and the second silicide are aligned with a spacer (31) disposed along sidewalls of the gate electrode, said gate electrode having a third silicide layer (33) formed on a top surface of the gate electrode, said source/drain extension having less dopant concentration (LDD) than the activated doped region and the source/drain extension and the first silicide layer (29) are aligned with the gate electrode to have the less dopant concentration of the extension reside between the channel region and the activated doped region. See figure 3H.

Art Unit: 2815

The claim also includes the limitation "*said second and third silicide layers formed after removing a portion of said barrier layer formed over a top surface of the gate electrode*", this is a product by process limitation. A "product by process" claim is directed to the product per se, no matter how actually made, In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Marosi et al, 218 USPQ 289; and particularly In re Thorpe, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

With regard to Claim 78, Son teaches an activated doped region (30) that is thicker than the source/drain extension (27).

With regard to Claim 79, Son teaches a second silicide layer (33) that is thicker than a second silicide layer (29).

With regard to Claim 80, Son teaches an activated doped region (30) and a source/drain extension (27) that comprise ion implanted material (N-type impurity ions).

Art Unit: 2815

With regard to Claims 81 and 82, Son teaches first (29) and second (33) silicide layers that can comprise either the same or different metals (titanium, nickel, cobalt).

With regard to Claims 83-87, Son teaches first (29) and second (33) silicide layers that can comprise CoSi₂, TiSi₂ or nickel silicide.

With regard to Claim 88, Son teaches second and third silicide layers (33) that comprise a same metal.

With regard to Claim 89, Son teaches a barrier layer (26) that comprises silicon nitride (column 3, lines 48-51).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 76 and 90 are rejected under 35 U.S.C. § 103 (a) as being unpatentable over Son (U.S. Patent No. 6,063,681). With regard to Claims 76 and 90, Son essentially teaches the claimed

Art Unit: 2815

invention but fails to show, the source/drain extension having a thickness 300-500 angstroms in thickness. It would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Son to include an extension having a thickness 300-500 angstroms in thickness, in order to control short channel effect and therefore increase the speed of the transistor. Additionally, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Response to Arguments

3. Applicant's arguments with respect to claims 63-90 have been considered but are not deemed persuasive for the reasons stated in the body of the office action. Applicant first argues regarding the 35 U.S.C. § 102 (e) of claims 63-75 and 77-89 that Son fails to teach or suggest the embodiments of the invention of claims 63 and 77 claiming "a gate electrode having a barrier layer formed on a sidewall of the gate electrode to prohibit the silicidation of the sidewall". However, the examiner disagrees and notes that, as stated in the rejection, Son teaches a substrate (21), a gate electrode (25) formed over the substrate and defining an underlying channel region in the substrate, said gate electrode having a barrier layer (26) formed on a sidewall of the gate electrode to prohibit silicidation of the sidewall. Applicants also argues that Son fails to teach or suggest "a second silicide layer formed after removing a portion of the barrier layer formed atop a top surface of the gate electrode" or "second and third silicide layers formed after removing a

Art Unit: 2815

portion of the barrier layer formed atop a top surface of the gate electrode”, however as also stated in the rejection, these are product by process limitations which do not structurally distinguish the claimed invention from that taught by Son and the rejection of these claims is maintained.

Applicant further argues, regarding the 35 U.S.C. § 103 (a) rejection of claims 76 and 90, that “the amendments to independent claims 63 and 77 overcome the rejections of claims 76 and 90 for the reasons stated above in reference to the Son patent”. As shown above, the claimed invention does not structurally or patentably distinguish from that taught by Son and the rejection of these claims is also maintained.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however,

Art Unit: 2815

will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Edgardo Ortiz (Art Unit 2815), whose telephone number is (703) 308-6183 or by fax at (703) 308-7724. In case the Examiner can not be reached by a direct telephone call, you might call Supervisor Eddie Lee at (703) 308-1690. Any inquiry of a general nature or relating to the status of this application should be directed to the Group 2800 receptionist whose telephone number is (703) 308-0956.

EO / AU 2815

3/17/03

A handwritten signature in black ink, appearing to read 'Eddie Lee', with a large, sweeping initial 'E'.

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800